

PRELIMINARY DATA SUMMARY

June 1992

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Measurements and Analysis work units at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, North Carolina. The FRF staff collected and analyzed these data. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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PART I: INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Figure 1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The pier deck is 6.1 m wide and extends from behind the duneline to about the 6-m water depth contour at a height of 7.6 m above the National Geodetic Vertical Datum (NGVD) of the year 1929. In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Questions and/or comments concerning the data may be directed to Mr. Clifford F. Baron at (919) 261-3511.

Part II presents the meteorological data; Parts III through VI present oceanographic data; Part VII presents nearshore profiles and bathymetry; and Part VIII, if included, documents special events that occurred at the FRF during the month.

Table 1 is a list of instruments used, their operational status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depths at the wave gages and current meters vary and may be determined from information contained in Figure 7. Other installation information is contained in Table 1.

Times given in the report, unless otherwise specified, are referenced to eastern standard time (EST).

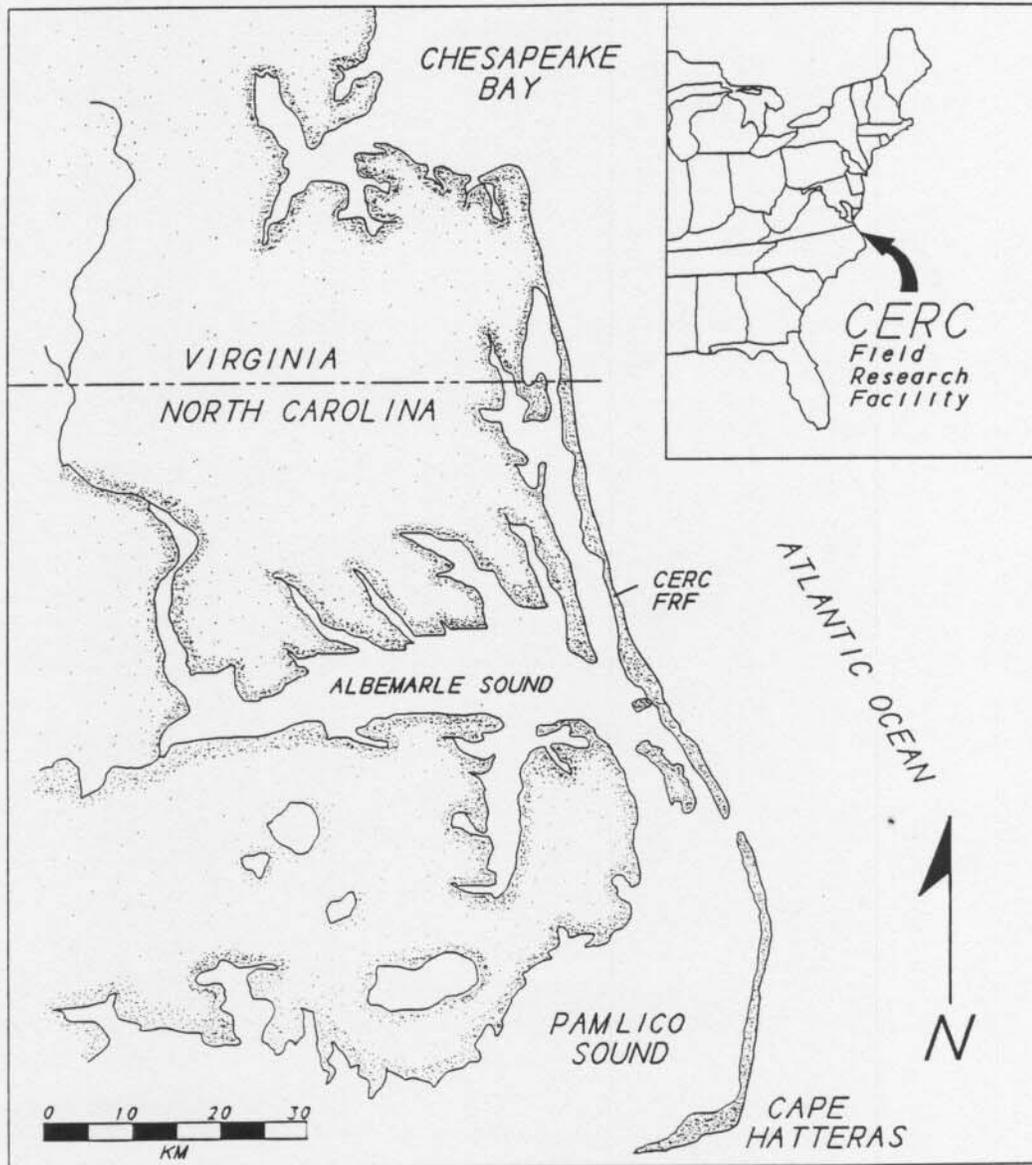


Figure 1. FRF Location Map

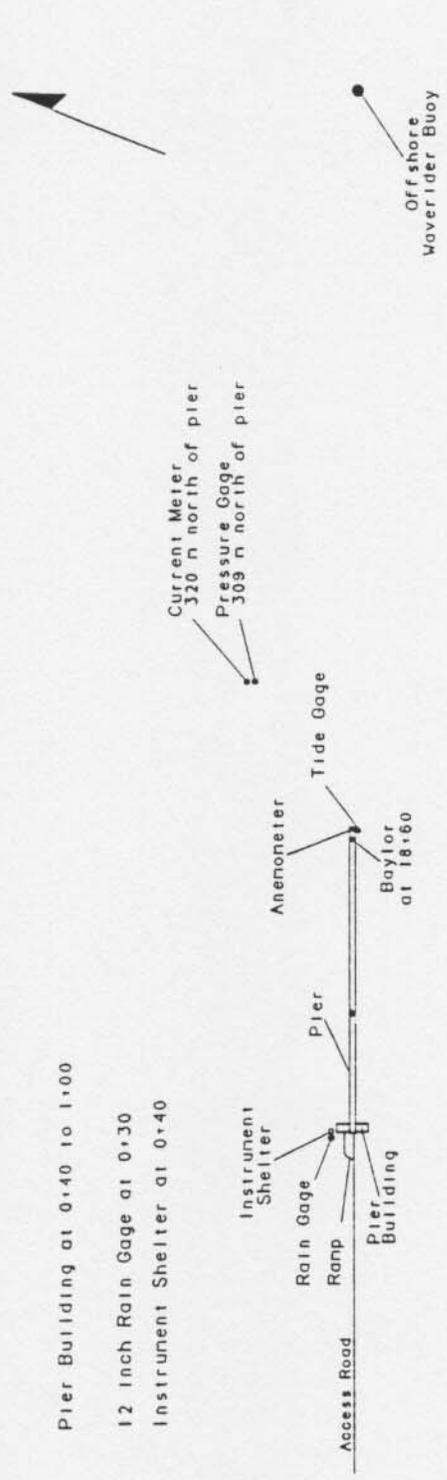
Table 1: Instrument Status/Data Availability

JUN 1992

Gage ID	Description/Remarks	Depth at Sensor		Day of the month																														
				1	2	3	4	5	6	7	8	9	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3			
616	Barometric Pressure		Gage Status	*																														
			Data Collected	*																														
604	Precipitation		Gage Status	*																														
			Data Collected	*																														
624	Air Temperature		Gage Status	*																														
			Data Collected	*																														
932	Anemometer at seaward end of pier Elevation 19 m (NGVD)		Gage Status	*																														
			Data Collected	*																														
625	Baylor staff at station 18+60 on FRF pier	see Figure 7	Gage Status	*																														
			Data Collected	*																														
111	Pressure gage 309 m north of FRF pier (0.9 km offshore)	Approx. 7.8 m NGVD	Gage Status	*																														
			Data Collected	*																														
630	Waverider buoy 6.0 km offshore	Approx. 17 m NGVD	Gage Status	*																														
			Data Collected	*																														
519	Current meter 320 m north of FRF pier (0.9 km offshore)	see Figure 7	Gage Status	*																														
			Data Collected	*																														
865-1370	NOAA tide station at seaward end of FRF pier		Gage Status	*																														
			Data Collected	*																														
Supplemental Observations (daily oceanographic and meteorological observations)			Daily observation	*																														

Gage Status	Daily Observation	Analog Record	Data Collected
Operational = *	Complete = *	Complete = *	All = *
Partial = /	Partial = /	Partial = /	Partial = /
Non-Operational = -	None = -	None = -	None = -

True North



Pier Building at 0+40 to 1+00

12 inch Rain Gage at 0+30

Instrument Shelter at 0+40

CURRITUCK SOUND

ATLANTIC OCEAN

Offshore Waverider Buoy (No. 630)

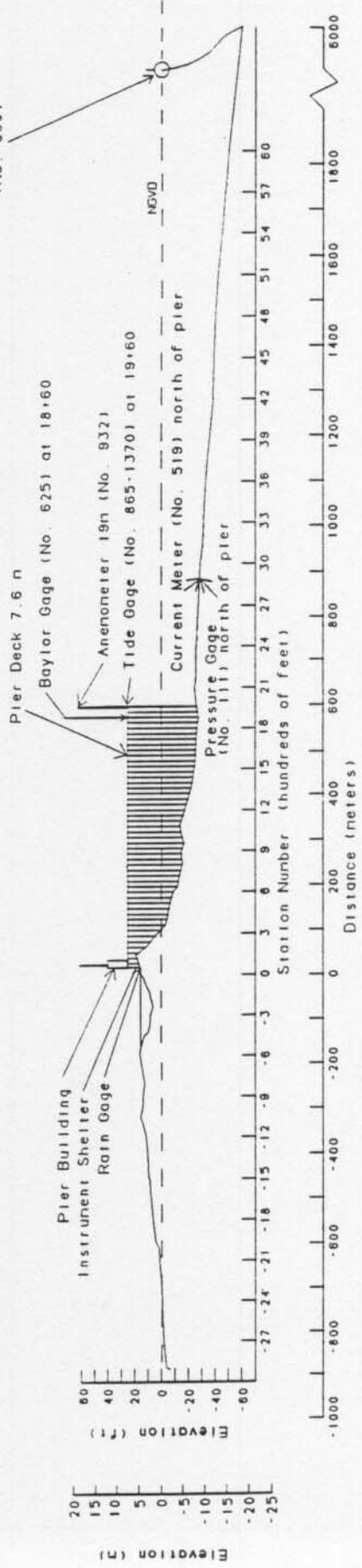


Figure 2. Instrument locations at FRF (all elevations from NGVD, all distances from FRF baseline).

PART II: METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Figure 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored using a Digital Equipment Corporation VAX 11/750. For each instrument a log is maintained and the records are stored for future reference.

Winds were measured at the end of the pier at an elevation of 19 m (Figure 2) using a WeatherMeasure Skyvane anemometer.

Monthly resultant wind speeds and directions are determined by vector averaging the data. Temperature and atmospheric pressure means are the average of the values presented for the month. Total precipitation is the sum for the month.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in.) -
 $\text{mm} \times .03937 = \text{in.}$
2. Millibars (mb) to inches of mercury (in. Hg) -
 $\text{mb} \times 0.02953 = \text{in. Hg}$
3. Degrees Celsius (C) to degrees Fahrenheit (F) -
 $(\text{C} \times 9/5) + 32 = \text{F}$
4. Meters per second (m/s) to knots (kn) -
 $\text{m/s} \times 1.943 = \text{kn}$

Table 2: Meteorological Data

Jun 1992

Day	Hour	Wind	Wind	Temperature	Atm	Precipitation
		Speed m/sec	Direction deg TN	deg C	Pressure mb	mm
1	100	3	275	19.5	1010.4	0
	700	5	339	18.1	1010.8	0
	1300	3	32	20.0	1010.8	0
	1900	3	147	17.9	1011.0	0
2	100	3	229	17.8	1011.9	0
	700	4	19	18.4	1013.1	0
	1300	5	73	16.6	1014.2	0
	1900	6	86	16.0	1014.6	0
3	100	0		14.2	1015.5	0
	700	4	39	17.1	1016.6	0
	1300	4	91	19.5	1016.2	0
	1900	3	114	16.8	1015.1	0
4	100	3	115	17.5	1013.5	0
	700	6	111	18.8	1012.4	0
	1300	7	111	18.9	1010.6	0
	1900	7	106	18.3	1008.3	0
5	100	9	119	19.1	1005.6	3
	700	7	174	22.3	1004.7	0
	1300	5	160	21.5	1004.2	0
	1900	2	277	25.4	1004.8	3
6	100	3	232	25.5	1005.6	0
	700	3	228	25.3	1008.3	0
	1300	6	130	23.9	1010.1	0
	1900	5	160	19.7	1010.9	0
7	100	4	216	23.4	1012.7	0
	700	4	226	24.2	1015.1	0
	1300	6	153	25.6	1015.2	0
	1900	7	185	26.7	1014.5	0
8	100	6	214	24.4	1015.6	0
	700	6	215	25.1	1016.2	0
	1300	5	202	31.0	1014.4	0
	1900	7	198	27.0	1012.5	0
9	100	8	218	25.1	1011.8	0
	700	5	245	24.8	1012.7	0
	1300	5	266	26.5	1010.1	0
	1900	5	322	25.6	1008.1	23
10	100	4	355	21.9	1008.7	7
	700	6	29	19.1	1009.9	0
	1300	5	27	21.6	1010.3	0
	1900	6	29	19.6	1010.9	0
11	100	6	31	19.6	1012.0	0
	700	5	31	20.1	1013.7	0
	1300	6	34	21.6	1015.3	0
	1900	6	58	19.7	1015.2	0
12	100	5	73	19.5	1015.9	0
	700	6	44	19.5	1016.3	0
	1300	7	64	20.7	1016.3	0
	1900	5	74	20.3	1015.4	0
13	100	4	68	20.4	1014.3	0
	700	5	51	20.8	1013.8	0
	1300	5	59	23.4	1013.5	0
	1900	4	67	20.9	1012.1	0
14	100	4	42	21.0	1011.2	0
	700	4	30	21.5	1011.9	0
	1300	3	26	23.9	1011.2	0
	1900	4	60	21.4	1010.0	0
15	100	0		19.8	1010.5	0
	700	3	295	23.4	1011.7	0
	1300	3	93	28.1	1011.8	0
	1900	5	153	23.1	1012.9	0
16	100	2	111	22.0	1014.6	0
	700	8	55	21.6	1017.5	0
	1300	8	65	23.0	1018.9	0
	1900	9	78	20.7	1020.1	0

* electronic problems

(Continued)

(Sheet 1 of 2)

Table 2: Meteorological Data

Jun 1992

Day	Hour	Wind Speed	Wind Direction	Temperature	Atm Pressure	Precipitation
		m/sec	deg TN	deg C	mb	mm
17	100	8	68	19.6	1020.3	0
	700	8	58	20.0	1021.8	0
	1300	8	73	21.5	1022.1	0
	1900	6	86	20.2	1020.9	0
18	100	2	103	20.3	1020.4	0
	700	4	86	22.4	1019.4	0
	1300	5	115	25.4	1018.2	0
	1900	5	160	22.9	1014.5	0
19	100	5	167	21.6	1012.0	0
	700	3	160	22.2	1010.1	0
	1300	3	219	24.7	1008.0	0
	1900	7	191	24.7	1005.2	0
20	100	5	211	23.2	1004.7	0
	700	4	256	23.8	1004.6	0
	1300	5	131	26.0	1004.7	0
	1900	4	331	24.0	1005.4	0
21	100	1	97	22.1	1006.2	0
	700	9	39	20.5	1008.0	0
	1300	10	1	18.8	1008.8	0
	1900	10	353	17.9	1009.7	0
22	100	12	351	17.8	1011.8	0
	700	10	336	16.4	1014.1	0
	1300	6	8	19.1	1014.0	0
	1900	3	123	17.7	1013.3	0
23	100	2	163	15.7	1014.5	0
	700	2	173	20.4	1014.6	0
	1300	6	129	23.4	1013.2	0
	1900	8	152	20.4	1011.2	0
24	100	4	166	19.6	1009.8	0
	700	4	184	23.6	1009.1	0
	1300	6	133	27.6	1006.5	0
	1900	7	196	25.6	1004.9	0
25	100	7	223	23.6	1004.6	0
	700	6	245	24.8	1005.7	0
	1300	1	157	30.1	1006.4	0
	1900	7	190	27.4	1006.8	0
26	100	3	237	25.2	1007.2	0
	700	2	8	22.8	1008.8	0
	1300	5	90	25.7	1008.1	0
	1900	7	159	24.4	1007.7	13
27	100	5	221	23.7	1005.2	4
	700	4	264	22.6	1006.3	0
	1300	2	94	25.9	1007.0	0
	1900	3	145	22.2	1008.0	0
28	100	1	133	21.4	1009.3	0
	700	6	3	22.8	1010.8	0
	1300	4	31	24.3	1012.3	0
	1900	3	82	21.8	1012.1	0
29	100	4	105	21.4	1013.0	0
	700	2	102	23.6	1013.7	0
	1300	4	108	26.8	1014.2	0
	1900	5	133	23.4	1012.7	0
30	100	2	129	21.6	1012.9	0
	700	1	152	25.3	1013.2	0
	1300	4	123	28.2	1012.5	0
	1900	6	150	24.3	1011.8	0
		<u>Resultant</u>		<u>Mean</u>	<u>Mean</u>	<u>Total</u>
		2	102	22.1	1011.7	53

* electronic problems

(Sheet 2 of 2)

PART III: WAVE DATA

Wave data are collected from a Baylor staff gages (Gage 625), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on optical disc using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 3 hr. This report reflects the data collection periods of 0100, 0700, 1300, and 1900 EST. The results are based only on the first 34 minute record. The sampling rate is two times per second for five contiguous 34-min records.

Wave height H_{m0} is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. Wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. Peak wave period T_p is defined as the period associated with the maximum energy in the spectrum. When this analysis is complete, the data are written to optical disc.

Table 3 presents the wave heights and periods for each wave record obtained at 6 hr intervals during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed from this data. Figure 3 is a time history of all H_{m0} and T_p values obtained for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, the presence of multiple wave trains containing nearly equal energy, and statistical variations in spectral estimations.

Table 3: Wave Data

Jun 1992

Day	Hour	625		111		630	
		Baylor at 18+60	Pressure Gage	Offshsr	Wvrdr		
		Hmo,m	Ip,sec	Hmo,m	Ip,sec	Hmo,m	Ip,sec
1	0100	0.68	6.09	0.69	6.92	0.82	7.31
	0700	0.62	8.83	0.67	7.31	0.69	8.00
	1300	0.61	9.85	0.62	9.85	0.67	8.83
	1900	0.52	7.53	0.55	9.14	0.57	7.76
2	0100	0.47	9.48	0.49	8.83	0.49	10.24
	0700	0.48	10.24	0.51	10.67	0.50	8.53
	1300	0.51	9.48	0.46	9.85	0.54	9.14
	1900	0.57	9.48	0.41	9.85	0.60	9.14
3	0100	0.41	8.83	0.41	9.48	0.47	8.53
	0700	0.59	5.57	0.58	5.22	0.65	8.26
	1300	0.56	7.11	0.55	7.11	0.56	6.92
	1900	0.48	7.76	0.46	8.26	0.52	7.76
4	0100	0.41	8.53	0.38	8.26	0.47	7.76
	0700	0.44	8.53	0.43	7.76	0.50	7.31
	1300	0.40	8.26	0.36	8.00	0.49	8.26
	1900	0.51	8.00	0.44	4.34	0.59	4.49
5	0100	0.71	5.12	0.67	3.33	0.86	5.45
	0700	0.83	6.24	0.83	6.09	1.02	6.09
	1300	0.94	6.74	0.90	7.31	1.12	6.74
	1900	0.81	7.53	0.85	7.76	0.98	7.31
6	0100	0.82	6.74	0.88	7.11	0.96	6.74
	0700	0.85	8.53	0.93	8.26	1.00	8.83
	1300	0.87	8.53	0.97	8.00	1.07	7.31
	1900	0.91	9.48	0.98	8.83	1.02	8.53
7	0100	0.79	10.67	0.86	9.14	0.92	10.67
	0700	0.78	8.26	0.78	8.53	0.87	8.53
	1300	0.76	8.83	0.76	8.53	0.84	8.00
	1900	0.73	7.76	0.70	8.26	0.85	8.53
8	0100	0.70	8.83	0.65	11.13	0.78	8.26
	0700	0.64	11.13	0.68	9.48	0.73	9.14
	1300	0.63	10.24	0.61	9.14	0.69	10.67
	1900	0.56	9.48	0.57	9.85	0.68	10.24
9	0100	0.52	10.24	0.48	8.53	0.65	8.26
	0700	0.44	10.67	0.48	9.14	0.54	8.53
	1300	0.48	8.26	0.49	8.53	0.52	8.00
	1900	0.43	9.14	0.43	9.85	0.54	9.85
10	0100	0.46	8.26	0.44	8.53	0.53	8.53
	0700	0.63	9.85	0.46	9.48	0.64	8.83
	1300	0.64	9.14	0.66	8.53	0.86	3.77
	1900	0.60	9.14	0.63	9.48	0.78	8.83
11	0100	0.79	9.14	0.74	8.00	0.93	8.53
	0700	0.64	9.85	0.62	9.14	0.73	9.48
	1300	0.71	9.14	0.68	9.14	0.79	9.14
	1900	0.85	8.83	0.74	9.48	0.87	7.53
12	0100	0.78	8.83	0.70	9.48	0.87	9.85
	0700	0.78	6.92	0.69	9.85	0.85	6.74
	1300	1.04	7.31	0.92	7.31	1.13	6.92
	1900	0.83	7.11	0.76	6.09	0.96	6.56
13	0100	0.73	9.14	0.73	9.14	0.86	6.92
	0700	0.90	6.40	0.88	6.74	0.98	6.92
	1300	0.89	6.56	0.78	6.92	1.03	6.40
	1900	0.94	6.40	0.87	7.11	0.97	8.00
14	0100	0.81	7.53	0.89	6.92	0.96	6.92
	0700	0.82	6.40	0.79	6.74	0.95	6.56
	1300	0.73	6.74	0.66	6.74	0.76	6.40
	1900	0.74	8.83	0.71	8.00	0.74	9.14
15	0100	0.72	7.31	0.64	8.00	0.80	7.53
	0700	0.72	7.76	0.68	8.00	0.71	7.53
	1300	0.55	7.76	0.56	7.31	0.59	7.31
	1900	0.51	7.11	0.51	8.00	0.55	7.76
16	0100	0.47	8.00	0.51	8.53	0.50	8.53
	0700	0.62	19.69	0.48	19.69	0.63	7.76
	1300	1.13	5.22	0.70	3.37	0.80	3.61
	1900	1.31	5.82	1.22	5.82	1.39	5.57

* Electronic problems

(Continued)

(Sheet 1 of 2)

Table 3: Wave Data

Jun 1992

Day	Hour	625		111		630	
		Baylor at 18+60		Pressure Gage		Offshr Wvrdr	
		Hmo,m	Tp,sec	Hmo,m	Tp,sec	Hmo,m	Tp,sec
17	0100	1.02	8.26	1.32	8.83	1.36	6.92
	0700	0.99	9.48	1.22	10.24	1.39	6.24
	1300	1.10	4.27	1.11	10.24	1.16	8.53
	1900	0.99	9.48	1.00	5.95	1.13	6.74
18	0100	0.81	8.83	0.85	17.07	0.92	8.53
	0700	0.81	17.07	0.83	16.00	0.84	8.53
	1300	0.74	17.07	0.74	17.07	0.83	8.53
	1900	0.64	16.00	0.65	8.26	0.75	8.53
19	0100	0.60	16.00	0.66	16.00	0.73	16.00
	0700	0.70	16.00	0.74	16.00	0.80	5.95
	1300	0.66	15.06	0.77	16.00	0.73	16.00
	1900	0.65	16.00	0.73	15.06	0.75	15.06
20	0100	0.59	15.06	0.61	15.06	0.74	6.24
	0700	0.53	15.06	0.63	15.06	0.66	15.06
	1300	0.51	8.53	0.57	15.06	0.64	15.06
	1900	0.46	15.06	0.52	14.22	0.56	15.06
21	0100	0.46	14.22	0.51	15.06	0.51	15.06
	0700	0.95	4.13	1.00	4.20	1.11	4.20
	1300	0.79	11.13	0.79	11.64	1.31	4.92
	1900	0.81	5.12	0.87	10.67	1.30	5.02
22	0100	0.94	4.57	0.98	4.49	1.38	4.83
	0700	0.99	5.22	1.01	5.22	1.41	5.33
	1300	0.86	5.82	0.93	5.69	1.10	5.57
	1900	0.57	10.24	0.60	8.83	0.72	6.74
23	0100	0.46	8.26	0.52	8.00	0.56	8.26
	0700	0.41	7.76	0.43	7.76	0.55	7.53
	1300	0.44	7.31	0.49	7.53	0.56	7.53
	1900	0.56	6.92	0.54	7.76	0.70	6.92
24	0100	0.43	7.53	0.44	8.00	0.59	6.92
	0700	0.38	9.85	0.38	9.48	0.47	9.85
	1300	0.44	9.85	0.46	9.14	0.55	6.74
	1900	0.47	9.14	0.48	9.48	0.62	9.48
25	0100	0.38	9.14	0.44	9.14	0.51	8.26
	0700	0.41	8.26	0.49	9.14	0.50	9.14
	1300	0.47	9.14	0.56	8.53	0.61	8.53
	1900	0.43	8.83	0.48	9.48	0.55	9.48
26	0100	0.40	9.14	0.48	8.26	0.50	7.76
	0700	0.42	9.14	0.46	9.14	0.50	9.48
	1300	0.45	8.00	0.52	9.85	0.59	8.26
	1900	0.38	9.14	0.44	8.83	0.53	9.14
27	0100	0.37	9.48	0.44	9.14	0.52	9.85
	0700	0.45	8.83	0.51	8.83	0.56	8.83
	1300	0.44	8.53	0.52	8.00	0.60	9.14
	1900	0.39	9.48	0.46	9.48	0.50	9.48
28	0100	0.51	8.26	0.58	7.76	0.64	8.00
	0700	0.53	8.83	0.63	9.14	0.70	9.14
	1300	0.56	8.83	0.62	8.26	0.71	8.83
	1900	0.51	9.14	0.59	8.83	0.67	8.53
29	0100	0.51	15.06	0.53	15.06	0.63	8.00
	0700	0.48	15.06	0.56	15.06	0.61	14.22
	1300	0.54	14.22	0.60	13.47	0.66	8.00
	1900	0.56	13.47	0.59	13.47	0.63	13.47
30	0100	0.48	15.06	0.52	12.19	0.56	11.13
	0700	0.45	12.19	0.51	12.19	0.58	12.19
	1300	0.51	8.26	0.56	11.13	0.59	8.83
	1900	0.53	8.83	0.58	8.26	0.65	10.67
	Mean	0.64	9.29	0.65	9.34	0.75	8.43
	Std dev	0.20	2.98	0.19	3.01	0.23	2.40

* Electronic problems

(Sheet 2 of 2)

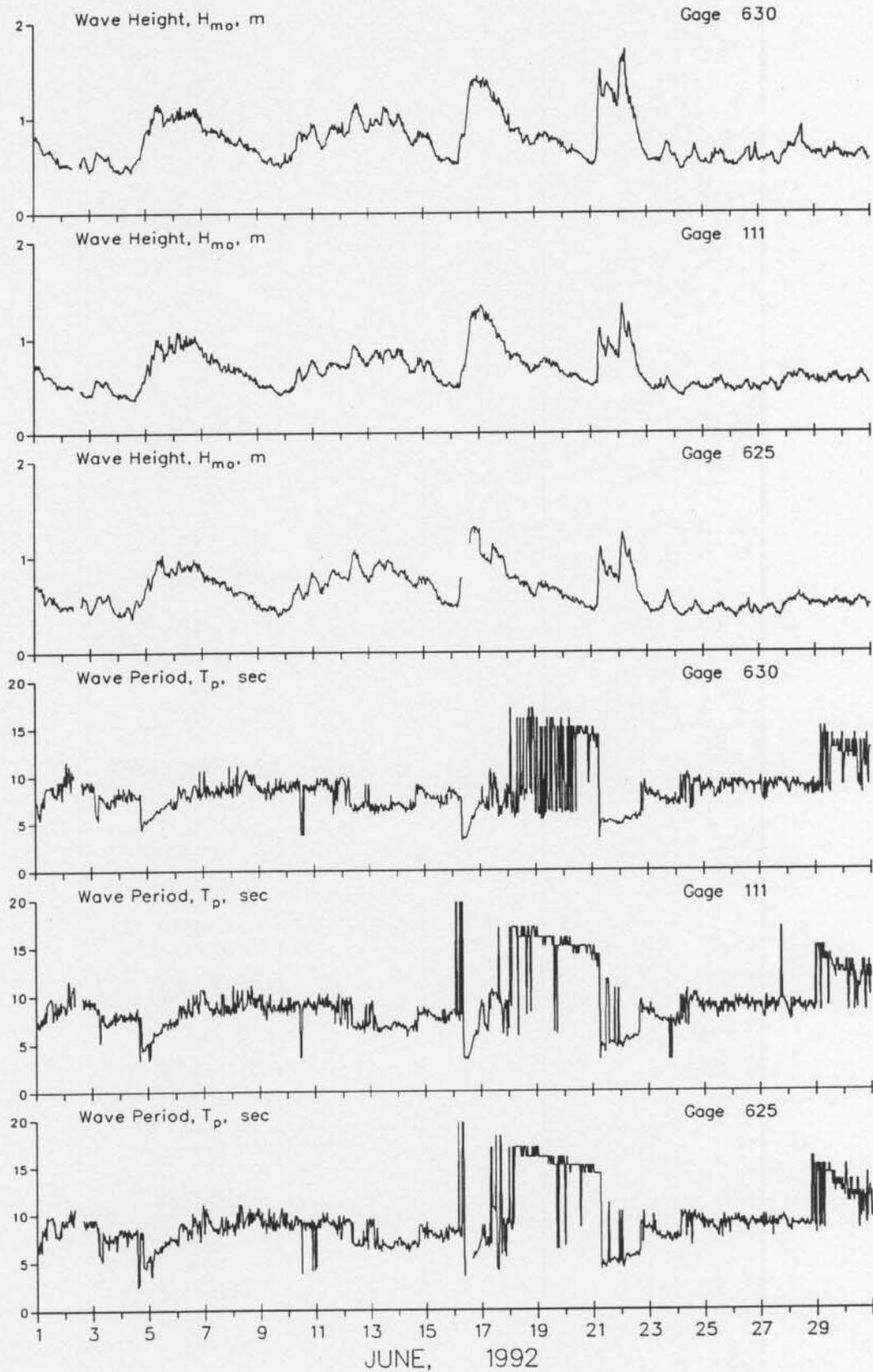


Figure 3. Time history of wave heights and periods

PART IV: CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, longshore currents flow either toward 340 deg (i.e. northward) or toward 160 deg (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second (cm/sec). Resultant speeds and directions are determined by vector averaging the data.

IMPORTANT NOTE

Direction resultants regarding the current meter data (gages 519 and 529) may be in error by minus 5 degrees due to a faulty compass reading. Please call us if you must use this data.

Table 4: Current Data
Jun 1992

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements					Beach Measurements (500m Updrift)			Current Meter 0.9 km Offshore Depth -5.6m (NGVD) ID #519	
			Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface) Distance from Baseline		Dye 12m offshore (surface)			Speed	Dir	
			Speed	Dir	(m)	Speed	Dir	Location	Speed			Dir
1	0100	-Along Cross Result									4 0 4	N 340
1	0700	-Along Cross Result	4 0 4	N 340	140	21 2 21	N off 346	15 N	South	3 2 3	S off 123	
1	1300	-Along Cross Result								5 3 6	S off 128	
1	1900	-Along Cross Result								4 1 4	N off 350	
2	0100	-Along Cross Result								25 8 26	S off 142	
2	0700	-Along Cross Result	61 0 61	S 160	140	10 1 10	S off 151	5 S	North	18 13 22	S off 124	
2	1300	-Along Cross Result								26 15 30	S off 131	
2	1900	-Along Cross Result								21 15 26	S off 125	
3	0100	-Along Cross Result								25 2 25	S off 155	
3	0700	-Along Cross Result	36 7 37	S on 171	140	8 3 9	S on 182	0	North	6 6 8	S off 116	
3	1300	-Along Cross Result								12 3 12	S off 147	
3	1900	-Along Cross Result								12 1 12	N 340	
4	0100	-Along Cross Result								0 2 2	 off 70	
4	0700	-Along Cross Result	30 0 30	N 340	140	24 5 25	N on 329	20 N	South	0 0 0	 S off 108	
4	1300	-Along Cross Result								4 5 6	S off 108	
4	1900	-Along Cross Result								7 3 8	N on 319	
5	0100	-Along Cross Result								2 2 2	S off 108	
5	0700	-Along Cross Result	29 0 29	N 340	140	61 6 61	N on 334	40 N	South	2 2 3	N on 297	
5	1300	-Along Cross Result								10 4 10	S off 140	
5	1900	-Along Cross Result								5 6 8	N on 292	

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Jun 1992

Day	Time	Alongshore Cross-shore Result	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter 0.9 km Offshore Depth -5.6m (NGVD) ID #519	
			Dye at (579 m) (surface) Speed	Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface) Location	Speed	Dir	Speed
6	0100	-Along Cross Result								0 3 3	 on 250
6	0700	-Along Cross Result	0 0 0		140	68 14 69	N off 351	21 South	N	6 8 10	S off 105
6	1300	-Along Cross Result								14 6 15	S off 136
6	1900	-Along Cross Result								2 3 4	S on 213
7	0100	-Along Cross Result								2 1 2	S on 184
7	0700	-Along Cross Result	30 12 33	N on 318	140	87 0 87	N off 340	8 South	N	2 1 2	S off 130
7	1300	-Along Cross Result								4 0 4	S 160
7	1900	-Along Cross Result								4 4 5	S on 203
8	0100	-Along Cross Result								5 6 8	N on 290
8	0700	-Along Cross Result	20 12 24	N off 11	143	47 5 47	N off 346	40 North	N	2 8 8	N on 266
8	1300	-Along Cross Result								2 1 2	N off 359
8	1900	-Along Cross Result								7 3 7	N off 2
9	0100	-Along Cross Result								7 12 14	N on 281
9	0700	-Along Cross Result	6 6 9	N off 25	140	87 13 88	N off 349	26 South	N	2 6 6	N on 270
9	1300	-Along Cross Result								7 0 7	N 340
9	1900	-Along Cross Result								1 6 6	S on 242
10	0100	-Along Cross Result								2 4 4	N on 277
10	0700	-Along Cross Result	22 3 22	S on 169	140	44 0 44	N off 340	19 South	N	5 3 5	S off 132
10	1300	-Along Cross Result								20 8 21	S off 137
10	1900	-Along Cross Result								36 10 37	S off 145

KEY = All speeds in cm/sec
N = Northward, Shore parallel
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on = onshore off = offshore

Table 4: Current Data (Continued)
Jun 1992

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter 0.9 km Offshore Depth -5.6m (NGVD) ID #519	
			Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface)		Dye 12m offshore (surface)			Speed	Dir
			Speed	Dir	Distance from Baseline (m)	Speed	Dir	Location	Speed		
11	0100	-Along Cross Result								22 8 23	S off 139
11	0700	-Along Cross Result	47 0 47	S on 160	140	61 0 61	N 340	28	N	24 9 26	S off 139
11	1300	-Along Cross Result								16 7 18	S off 136
11	1900	-Along Cross Result								12 3 12	S off 145
12	0100	-Along Cross Result								5 2 6	S off 136
12	0700	-Along Cross Result	3 0 3	S on 169	140	55 0 55	N 340	29	N	14 3 14	S off 149
12	1300	-Along Cross Result								7 2 7	S on 172
12	1900	-Along Cross Result								10 2 10	S off 150
13	0100	-Along Cross Result								8 2 8	N on 325
13	0700	-Along Cross Result	44 0 44	S on 160	140	76 0 76	N 340	68	N	7 0 7	S 160
13	1300	-Along Cross Result								3 9 9	S on 230
13	1900	-Along Cross Result								1 0 1	N 340
14	0100	-Along Cross Result								1 2 3	N off 45
14	0700	-Along Cross Result	38 0 38	S on 160	140	76 0 76	N 340	68	N	5 3 6	S off 134
14	1300	-Along Cross Result								15 6 16	S off 139
14	1900	-Along Cross Result								0 3 3	 off 70
15	0100	-Along Cross Result								6 2 6	S on 181
15	0700	-Along Cross Result	27 7 27	S off 146	140	68 17 70	N off 354	39	N	8 4 9	S off 134
15	1300	-Along Cross Result								6 6 8	S off 116
15	1900	-Along Cross Result								12 0 12	N 340

KEY = All speeds in cm/sec
N = Northward, Shore parallel
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on = onshore off = offshore

Table 4: Current Data (Continued)
Jun 1992

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter 0.9 km Offshore Depth -5.6m (NGVD) ID #519	
			Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface)		Dye 12m offshore (surface)			Speed	Dir
			Speed	Dir	Distance from Baseline (m)	Speed	Dir	Location	Speed		
16	0100	-Along Cross Result								2 3 4	N off 37
16	0700	-Along Cross Result	19 4 19	S off 149	140	38 4 38	N off 346	12 N	South	9 7 11	S off 122
16	1300	-Along Cross Result								48 8 48	S off 150
16	1900	-Along Cross Result								4 8 9	S off 93
17	0100	-Along Cross Result								15 7 17	S off 136
17	0700	-Along Cross Result	6 3 7	S on 182	152	36 0 36	N 340	8 N	South	7 4 8	S off 129
17	1300	-Along Cross Result								17 7 18	S off 138
17	1900	-Along Cross Result								9 2 9	N on 328
18	0100	-Along Cross Result								4 1 4	N off 352
18	0700	-Along Cross Result	36 9 37	N on 326	140	61 0 61	N 340	17 N	South	1 1 1	N off 41
18	1300	-Along Cross Result								12 2 12	S off 153
18	1900	-Along Cross Result								7 3 7	N on 317
19	0100	-Along Cross Result								9 2 9	N on 329
19	0700	-Along Cross Result	25 10 27	N off 2	143	61 6 61	N off 346	31 N	South	12 3 12	N on 326
19	1300	-Along Cross Result								3 0 3	S 160
19	1900	-Along Cross Result								13 3 14	N on 327
20	0100	-Along Cross Result								7 4 8	N on 311
20	0700	-Along Cross Result	6 5 8	N off 22	140	27 19 32	N off 15	37 N	South	6 3 6	N on 310
20	1300	-Along Cross Result								4 2 5	S off 139
20	1900	-Along Cross Result								4 1 5	N off 358

KEY = All speeds in cm/sec
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Continued)
Jun 1992

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter 0.9 km Offshore Depth -5.6m (NGVD) ID #519	
			Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface)		Dye 12m offshore (surface)			Speed	Dir
			Speed	Dir	Distance from Baseline (m)	Speed	Dir	Location	Speed		
21	0100	Along Cross Result								0	
21	0700	Along Cross Result	15 1 15	S on 166	152	61 12 62	S off 149	North	42	7 19 20	S off 89
21	1300	Along Cross Result								43 19 47	S off 136
21	1900	Along Cross Result								39 14 41	S off 140
22	0100	Along Cross Result								29 9 30	S off 142
22	0700	Along Cross Result	61 0 61	S 160	152	102 0 102	S 160	North	25	34 9 35	S off 144
22	1300	Along Cross Result								29 12 31	S off 137
22	1900	Along Cross Result								16 6 17	S off 140
23	0100	Along Cross Result								3 1 4	S off 137
23	0700	Along Cross Result	13 5 14	N off 2	152	51 15 53	N on 323	South	13	4 0 4	S 160
23	1300	Along Cross Result								3 1 3	N on 313
23	1900	Along Cross Result								13 7 15	N on 311
24	0100	Along Cross Result								22 8 23	N on 319
24	0700	Along Cross Result	29 6 30	N off 351	152	51 5 51	N on 334	South	14	25 6 26	N on 327
24	1300	Along Cross Result								13 2 13	N on 331
24	1900	Along Cross Result								2 5 5	N on 270
25	0100	Along Cross Result								8 3 9	N on 318
25	0700	Along Cross Result	0 5 5	 off 70	165	25 15 30	N off 11	South	4	0 3 3	 on 250
25	1300	Along Cross Result								0 11 11	 off 70
25	1900	Along Cross Result								1 2 2	N off 31

KEY = All speeds in cm/sec
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Concluded)
Jun 1992

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements					Beach Measurements (500m Updrift)			Current Meter 0.9 km Offshore Depth -5.6m (NGVD) ID #519	
			Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed Dir		Dye 12m offshore (surface) Location	Speed Dir		Speed	Dir
			Speed	Dir		Speed	Dir		Speed	Dir		
26	0100	Along Cross Result								3 1 3	N on 316	
26	0700	Along Cross Result	0 3 3	S on 250	152	38 15 41	N off 2	South	9	6 7 10	S off 109	
26	1300	Along Cross Result								6 1 6	S off 148	
26	1900	Along Cross Result								5 15 16	S off 90	
27	0100	Along Cross Result								3 2 3	N on 306	
27	0700	Along Cross Result	11 3 11	S off 143	152	51 20 55	N off 2	South	35	10 21 23	S off 96	
27	1300	Along Cross Result								2 4 5	N on 280	
27	1900	Along Cross Result								5 1 5	S on 168	
28	0100	Along Cross Result								1 6 6	S off 82	
28	0700	Along Cross Result	61 0 61	S 160	177	20 0 20	S 160	North	4	19 8 20	S off 138	
28	1300	Along Cross Result								20 12 23	S off 129	
28	1900	Along Cross Result								28 14 31	S off 133	
29	0100	Along Cross Result								2 12 13	S off 79	
29	0700	Along Cross Result	11 3 11	S off 146	140	61 0 61	N 340	South	18	5 4 6	S on 195	
29	1300	Along Cross Result								7 2 7	S off 144	
29	1900	Along Cross Result								1 3 3	S off 70	
30	0100	Along Cross Result								2 1 3	N off 10	
30	0700	Along Cross Result	5 3 6	N on 309	140	38 10 39	N on 326	South	11	1 4 4	N on 264	
30	1300	Along Cross Result								7 4 7	S off 132	
30	1900	Along Cross Result								20 6 21	N on 323	

KEY = All speeds in cm/sec
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PART V: SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves but not surface chop or capillary waves) are taken daily at the seaward end of the pier. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring the alignment of the wave crests at approximately the same location as the visual measurements. The pier axis (considered perpendicular to the beach at the FRF) is oriented 70 deg east of true north; consequently, wave angles greater than 70 deg indicate that the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are also taken daily at the seaward end of the pier. A Bucket Thermometer is lowered about 0.3 m into the water and allowed to remain for at least one minute. The temperature is then read, and a hydrometer is used to determine the density. A Secchi disc is used to determine the depth of visibility.

Table 5: Supplemental Observations

Jun 1992

Day	Time	Wave Approach Angle at Pier End deg from True N		Radar Wave Angle deg from True N	Width of Surf Zone,m	Water Characteristics at Pier End		
		Primary	Secondary			Temp.,C	Density g/cc	Secchi Vis.,m
1	0742	120			37	15.0	1.0238	2.4
2	0740	120			41	17.8	1.0194	1.8
3	0710	50		55	43	18.3	1.0188	2.1
4	0750	80		95	34	18.9	1.0188	2.4
5	0750	105			62	16.7	1.0227	1.2
6	0900	115			78	14.4	1.0241	2.1
7	0940	110			61	15.1	1.0236	1.2
8	0750	115	145		119	15.0	1.0240	1.2
9	0750	110			73	14.4	1.0242	1.5
10	0735	30		100	59	15.1	1.0240	2.7
11	0735	70	10	80	50	20.6	1.0189	2.7
12	0750	40		85	62	21.1	1.0177	2.4
13	0900	120		95	66	21.1	1.0178	2.1
14	0920	120		90	65	21.7	1.0181	2.4
15	0730	130			63	22.2	1.0183	4.3
16	0800	75		80	43	23.3	1.0178	3.0
17	0800	40		70	101	21.7	1.0188	2.1
18	0730	80		70	53	21.7	1.0191	2.4
19	0800	125			70	20.0	1.0221	2.1
20	0815	135			39	14.4	1.0246	1.2
21	0840	40		25	77	17.2	1.0233	2.1
22	0700	10		45	89	19.4	1.0196	1.2
23	0730	75			62	20.0	1.0198	1.5
24	0750	85			40	20.6	1.0211	2.4
25	0740	110			56	15.0	1.0242	3.7
26	0800	130			47	17.8	1.0236	2.4
27	0910	125			47	18.9	1.0224	2.4
28	0930	80	355	100	76	22.2	1.0196	2.1
29	0745	130			44	23.3	1.0172	2.7
30	0750	130			24	21.1	1.0200	3.7

PART VI: WATER LEVELS

Since 1978, the National Oceanic and Atmospheric Administration (NOAA)/National Ocean Service (NOS) has operated a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect instantaneous water level data every 6 minutes throughout the month.

The variation in water level during the month is shown in Figure 4 along with a list of mean and extreme values. This presentation is useful in identifying effects of both meteorological and astronomical forces on the open coast water level.

Table 6 contains the time at the center of each 12.42-hr tidal cycle and the range, high, low, and mean water levels during each tidal cycle.

FRF Tide Heights

Jun 1992

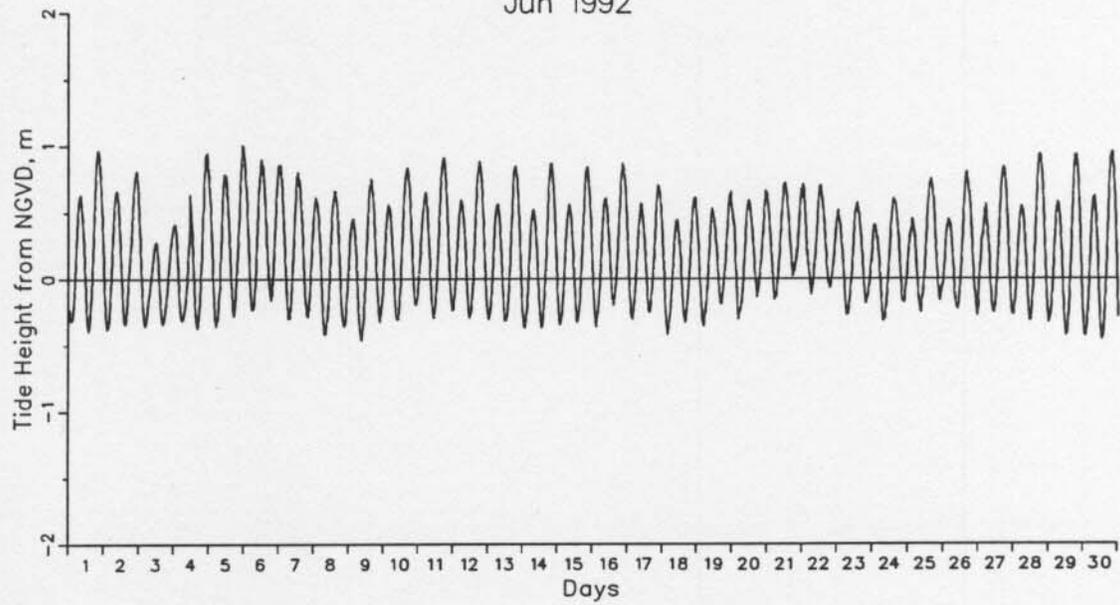


Figure 4. Water level time history

Monthly Water Levels, m NGVD

Extreme Low = -0.47 on day 9 at 806 EST
Extreme High = 1.01 on day 5 at 2224 EST
Monthly Mean = 0.20
Mean Low = -0.30
Mean High = 0.69
Mean Range = 0.99

Table 6: Water Levels,m NGVD

		Jun 1992			
Mid-Cycle		Low	High	Mean	Range
Day	Time				
1	1054	-0.34	0.64	0.12	0.98
1	2319	-0.40	0.97	0.32	1.37
2	1144	-0.38	0.66	0.13	1.04
3	9	-0.34	0.81	0.27	1.16
3	1234	-0.36	0.28	-0.04	0.63
4	100	-0.34	0.41	0.05	0.75
4	1325	-0.34	0.64	-0.02	0.98
5	150	-0.37	0.95	0.32	1.32
5	1415	-0.36	0.79	0.21	1.15
6	240	-0.28	1.01	0.38	1.29
6	1506	-0.23	0.91	0.34	1.14
7	331	-0.16	0.86	0.36	1.02
7	1556	-0.30	0.81	0.25	1.11
8	421	-0.30	0.62	0.16	0.91
8	1646	-0.42	0.67	0.14	1.09
9	512	-0.36	0.46	0.04	0.82
9	1737	-0.47	0.76	0.18	1.23
10	602	-0.33	0.56	0.13	0.89
10	1827	-0.31	0.84	0.29	1.15
11	652	-0.20	0.66	0.21	0.85
11	1918	-0.30	0.91	0.33	1.21
12	743	-0.24	0.60	0.17	0.84
12	2008	-0.30	0.89	0.31	1.19
13	833	-0.31	0.57	0.12	0.87
13	2058	-0.32	0.85	0.27	1.17
14	924	-0.37	0.53	0.08	0.90
14	2149	-0.37	0.87	0.27	1.24
15	1014	-0.35	0.56	0.11	0.91
15	2239	-0.33	0.84	0.27	1.17
16	1104	-0.36	0.61	0.14	0.97
16	2329	-0.20	0.87	0.33	1.07
17	1155	-0.30	0.57	0.12	0.88
18	20	-0.25	0.71	0.21	0.96
18	1245	-0.42	0.45	0.02	0.87
19	110	-0.33	0.62	0.15	0.95
19	1335	-0.36	0.54	0.10	0.89
20	201	-0.26	0.66	0.22	0.91
20	1426	-0.30	0.59	0.18	0.90
21	251	-0.15	0.67	0.26	0.82
21	1516	-0.16	0.73	0.32	0.88
22	341	-0.05	0.72	0.32	0.77
22	1607	-0.12	0.71	0.31	0.83
23	432	-0.27	0.52	0.16	0.79
23	1657	-0.27	0.57	0.18	0.85
24	522	-0.32	0.41	0.08	0.73
24	1747	-0.31	0.61	0.21	0.92
25	613	-0.22	0.45	0.10	0.67
25	1838	-0.25	0.75	0.30	1.01
26	703	-0.20	0.45	0.12	0.66
26	1928	-0.23	0.80	0.32	1.04
27	753	-0.28	0.56	0.13	0.84
27	2019	-0.26	0.84	0.33	1.10
28	844	-0.28	0.55	0.12	0.83
28	2109	-0.32	0.94	0.35	1.26
29	934	-0.39	0.58	0.10	0.97
29	2159	-0.43	0.94	0.29	1.37
30	1025	-0.43	0.62	0.07	1.05
30	2250	-0.46	0.96	0.29	1.41

PART VII: NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Geodimeter surveying system; a Geodimeter 140-T self-tracking, electronic theodolite, distance meter, in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

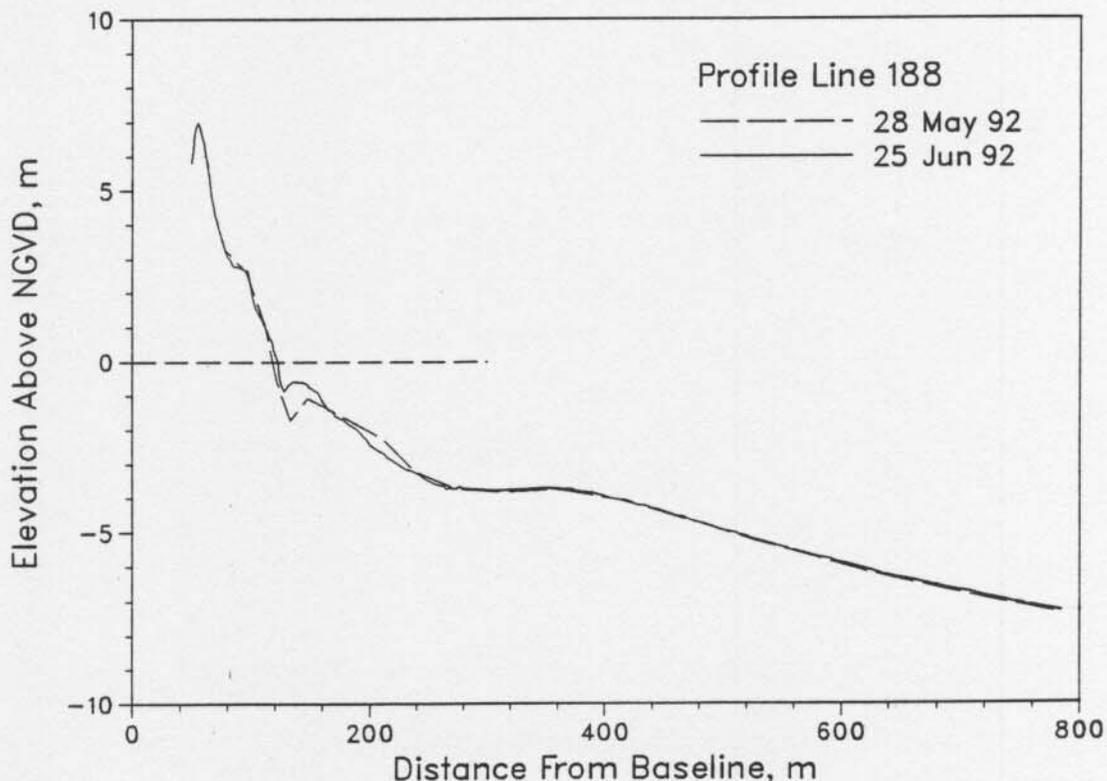


Figure 5. Monthly CRAB profiles on profile 188 - 517 m south of pier.

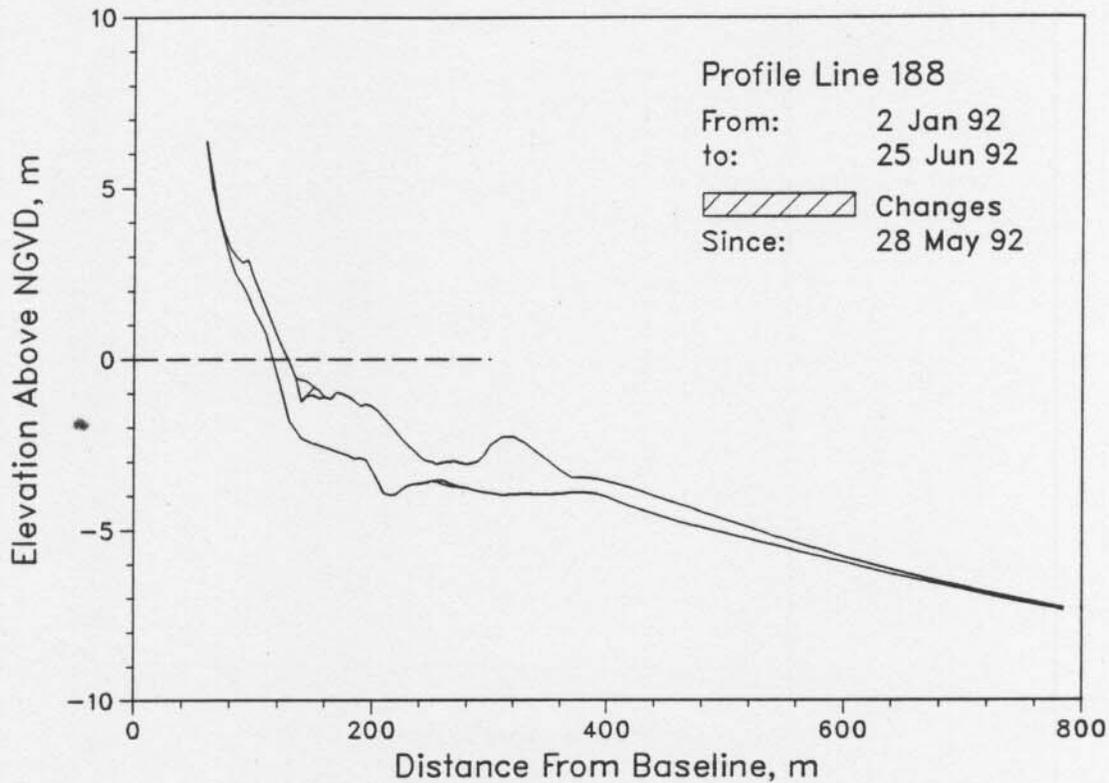


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. Figure 7 includes a two- and three-dimensional contour map and a change plot derived from the bathymetric survey on 25 June. Wide contour lines on the change diagram represent eroded areas; thin lines indicate deposition.

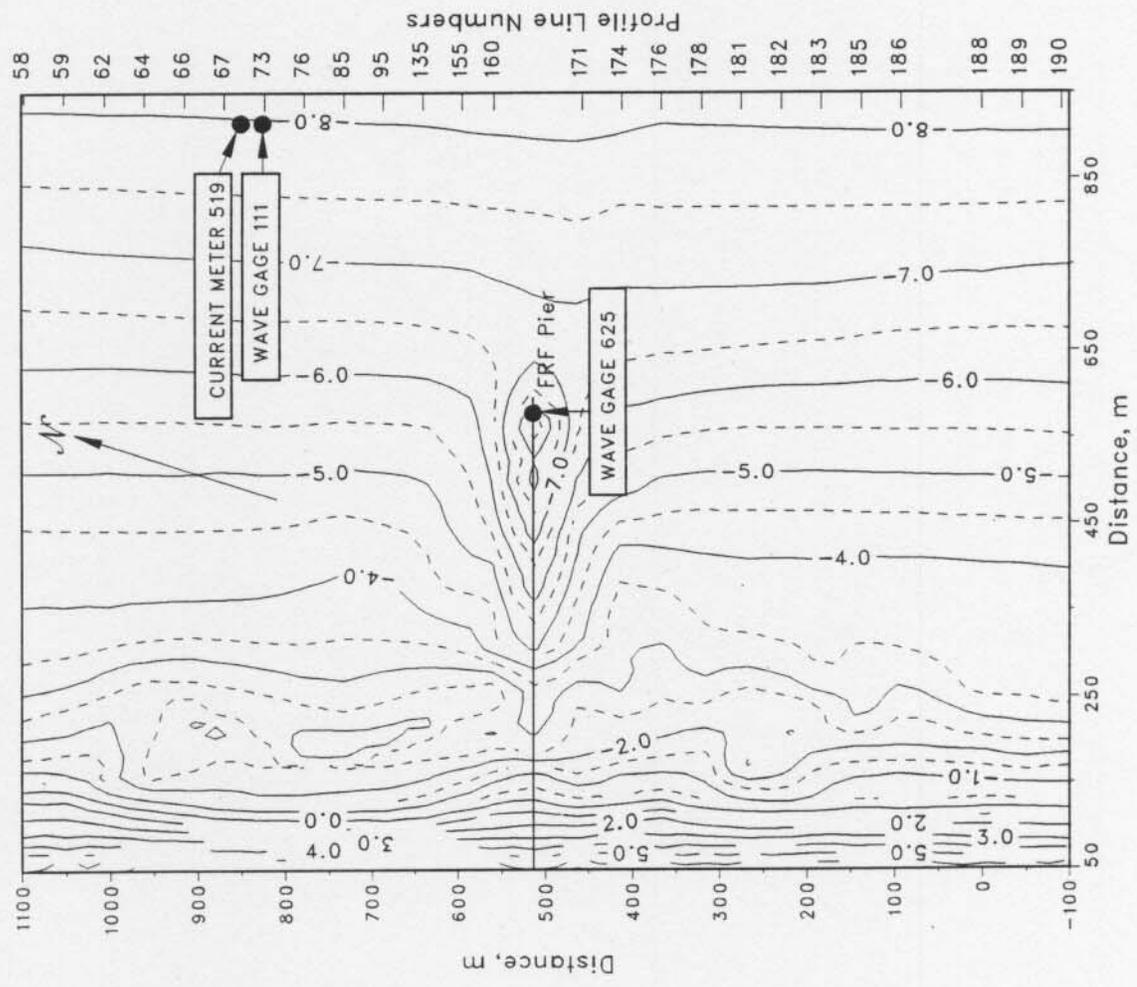
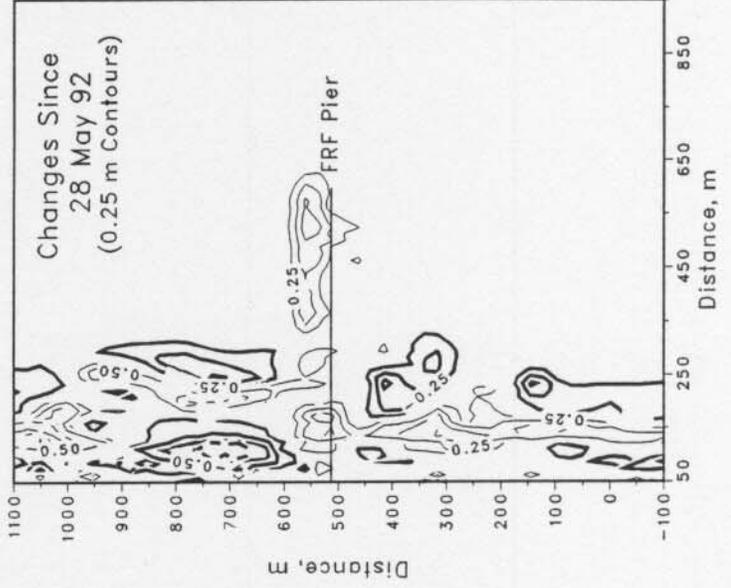
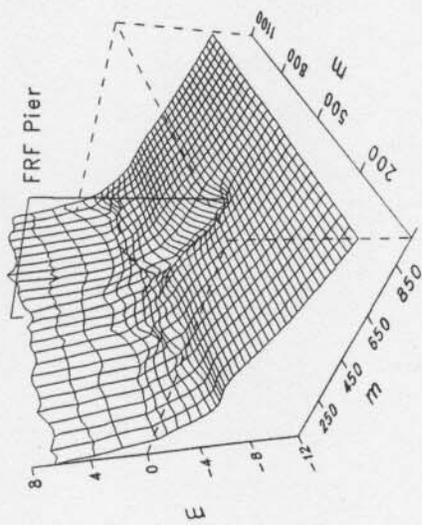


Figure 7. FRF bathymetry 25 Jun 92 depths relative to NGVD

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